

# Esri Developer Summit

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[esri.com/events/devsummit](http://esri.com/events/devsummit)



## Leveraging OGC Services in ArcGIS Server

Satish Sankaran, Esri

Yingqi Tang, Esri

A decorative graphic at the bottom of the slide. It features a curved orange border at the top. Below the border is a semi-transparent map of a landscape with green fields and blue water. Overlaid on the map is white text representing code snippets. The code includes symbols like 'esri.symbol.SimpleLineSymbol', 'new dojo.Color([0,0,0,0.5])', and 'feature.setSymbol(polySymbolGreen)'.

```
esri.symbol.SimpleLineSymbol  
new dojo.Color([0,0,0,0.5])  
polySymbolGreen = new esri.symbol.SimpleLineSymbol(  
    color, 1);  
feature.setSymbol(polySymbolGreen);  
}  
else if(f == 1) {  
    var polySymbolGreen = new esri.symbol.SimpleLineSymbol(  
        color, 1);  
    polySymbolGreen.setOutlineColor([0,0,0,0.5]);  
    feature.setSymbol(polySymbolGreen);  
}  
else if(f == 2) {  
    polyBlue = new esri.symbol.SimpleLineSymbol(  
        color, 1);  
    polyBlue.setOutlineColor([0,0,0,0.5]);  
    feature.setSymbol(polyBlue);  
}
```

# GIS

- **Creating and Managing Geo Information Products**
  - Proprietary
  - Open Specifications
  - **Standards**
  
- **Dissemination of Geo Products**
  - Proprietary
  - Open Specifications
  - **Standards**

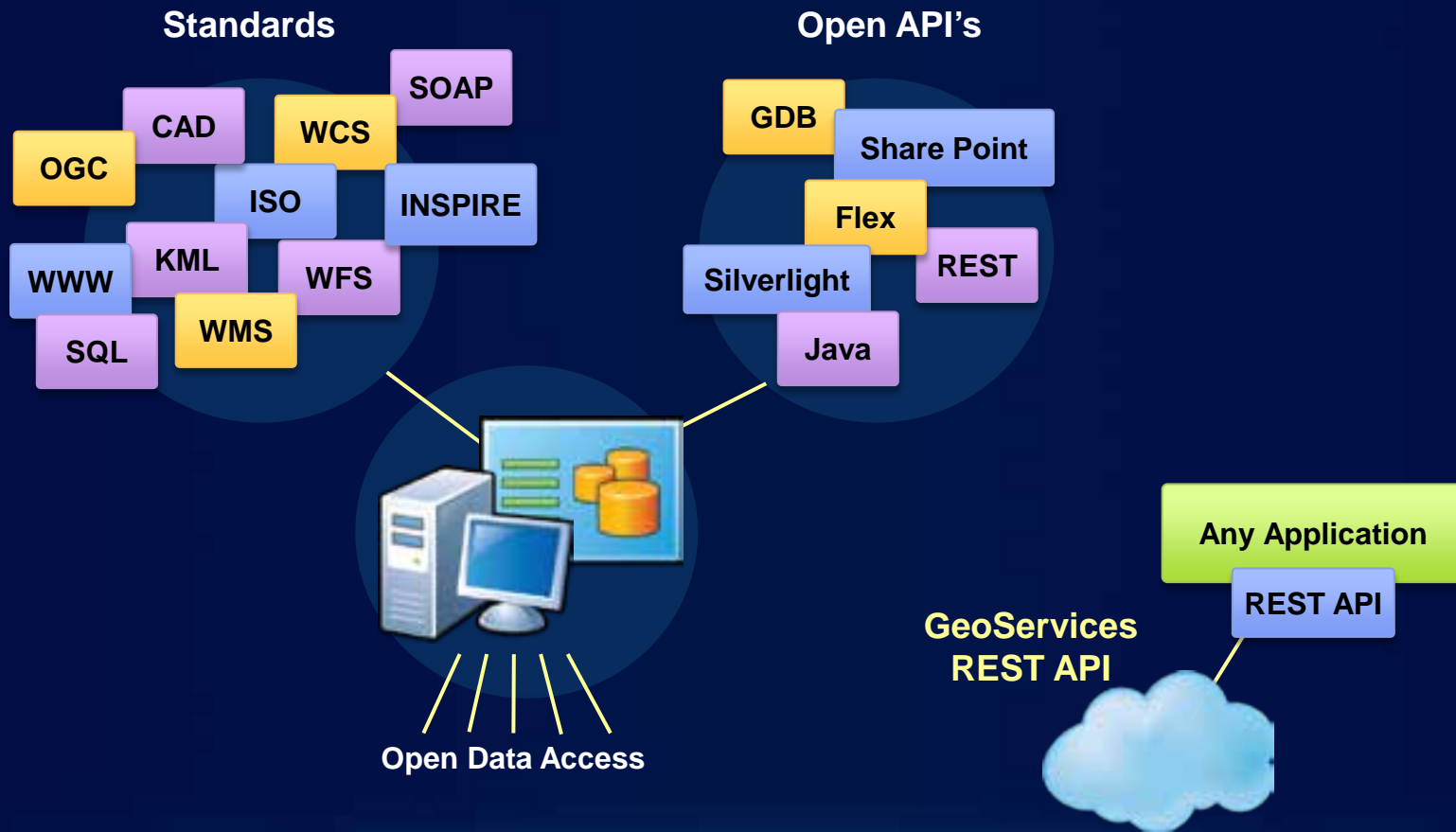
# ArcGIS — A Complete System

Easier  
More Powerful  
and Everywhere



# ArcGIS is Open & Interoperable

## Using Standards to Integrate with Any System



# Interoperability Enablers

## Standards used in creation of Geo Information products

- Data:
  - Simple Features Model, ...
  - WKT, WKB, Spatial Types, GML, netCDF, ...
- Metadata:
  - ISO 19139, FGDC, ...

## Standards used for Dissemination

- File Based
  - Simple Features Access, ...
- On Demand Services
  - OGC Web Services - WMS, WFS, WCS, CS-W, WMTS, WPS, ...







# Simple Features

- Simple Feature specification defines:
  - Data access model
  - Database schema
  - Geometry model for points, lines, polygons
  - “Well-Known” data formats for geometry and spatial reference
- ISO and OGC specifications for simple feature access

Feature Tables contain rows (features) sharing common properties (Feature Attributes).

Geometry is a Feature Attribute.

Feature Table

				
	10	area1	yellow	
	11	area2	green	
	12	area3	Blue	← Feature
	13	area4	red	

Geometry

Feature Attribute

# Simple Features

- Simple Feature specification
  - Common Architecture
    - Geometry Model
    - Well Known Text Representation for Geometry
    - Well Known Binary Representation for Geometry
    - Well Known Text Representation for Spatial reference Systems
    - ...
  - Part 2 – SQL Option
    - Database schema to support feature tables, Geometry, and Spatial Reference
    - SQL Geometry Type
    - SQL routines for constructing / obtaining a geometry object given its WKT, WKB representations
    - SQL Operations on Type Geometry
    - ...

# GML

**GML or Geography Markup Language is an XML based encoding Standard for geographic information developed by the Open Geospatial Consortium (OGC).**

- GML Profiles – Point profile, Simple Features Profile
  - Simple Feature profile
    - Initially motivated to help WFS use of GML 3
    - Constrains the many optional elements of GML schema
    - Provides 3 levels of compliancy: Level 0 , 1 and 2
- GML Application Schemas – OSMasterMap, CityGML, WaterML, O&M, Top10NL,....



# Interoperability Enablers

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## **Metadata standards**

- **Provide resource producers an idea of the metadata they should collect**
- **Provide consistent terminology for global search**
- **Provide an understanding of data – around the Globe and across information communities**

# ArcGIS 10 Metadata support

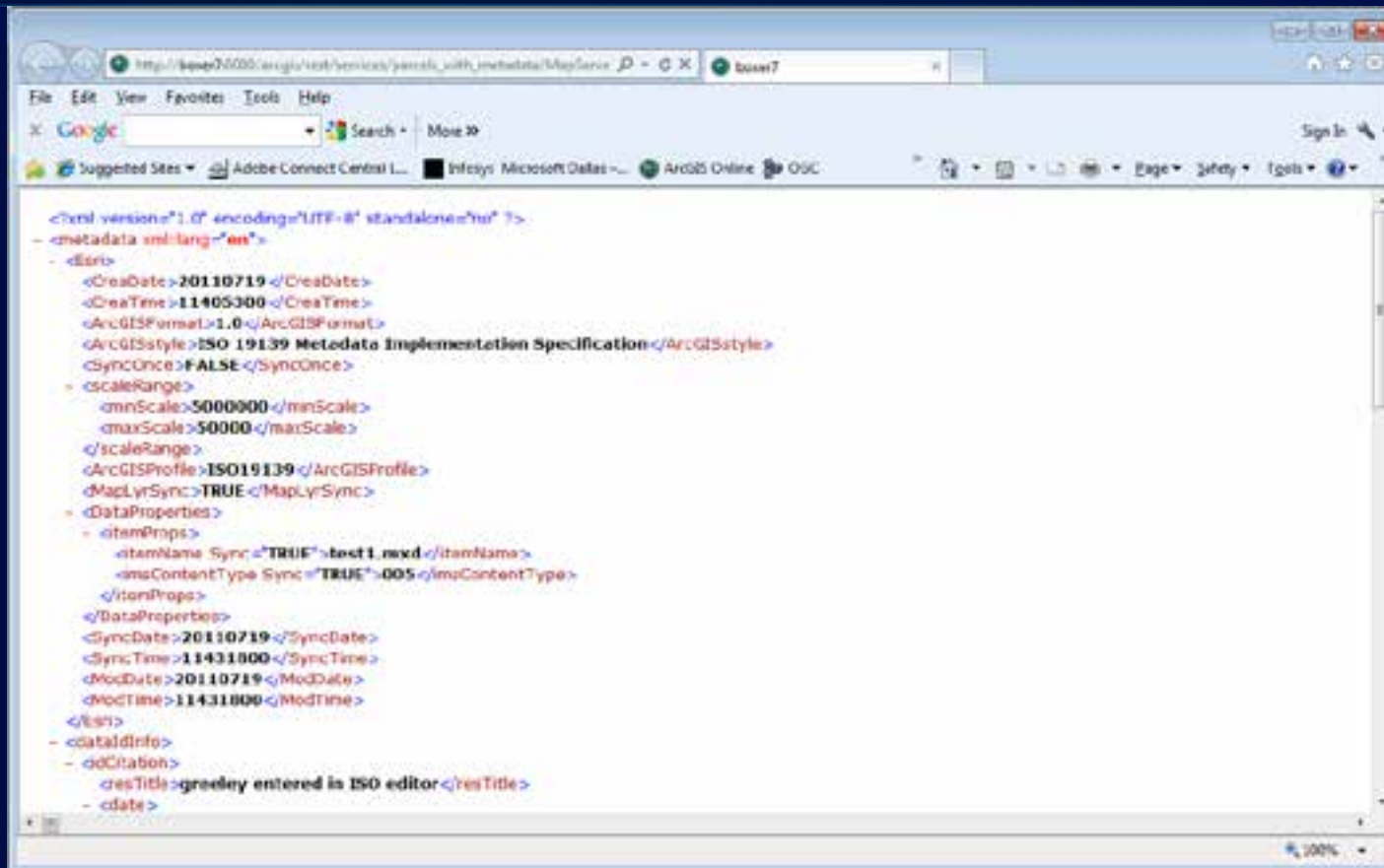
- **Make metadata easier**
- **Complete support for FGDC and many ISO metadata standards**
  - **Content Standard for Digital Geospatial Metadata**
  - **19115 – Metadata**
  - **19119 – Services**
  - **19139 – Implementation Specification for 19115 and 19119**
  - **19110 – Feature Cataloguing Methodology**
- **Support profiles of ISO metadata standards**
  - **North American Profile**
  - **INSPIRE**
- **Auto update of metadata per the data's intrinsic properties**
- **Validation - standards based metadata**
- **Extensible to support emerging profiles**
- **Templates supporting auto fill common metadata elements**
- **Provide methods for updating multiple metadata records (change address/phone number for example)**

# ArcGIS 10.1 Metadata Support - Server

The screenshot shows a web browser window with the following elements:

- Address Bar:** [http://boxer7:6080/arcgis/rest/services/parcels\\_with\\_metadata/info](http://boxer7:6080/arcgis/rest/services/parcels_with_metadata/info)
- Page Title:** Info (parcels\_with\_metadata)
- Navigation:** Home, Star, Settings icons.
- Menu Bar:** File, Edit, View, Favorites, Tools, Help.
- Search:** Google search bar with "Search" button and "More >>" link.
- Sign In:** Sign In button with a key icon.
- Suggested Sites:** Adobe Connect Central L...
- Page Controls:** Print, Page, Safety, Tools, and other utility icons.
- Page Content:**
  - ArcGIS REST Services Directory** [Login](#) | [Get Token](#)
  - Home > services > parcels\_with\_metadata (MapServer) > info** [Help](#) | [API Reference](#)
  - [JSON](#)
  - Info (parcels\_with\_metadata)**
  - Child Resources:** [Iteminfo](#) [Metadata](#) [Thumbnail](#)
- Footer:** 100% zoom level.

# ArcGIS 10.1 Metadata Support - Server



The screenshot shows a web browser window with the address bar containing the URL: [http://boxer7:6080/arcgis/rest/services/parcels\\_with\\_metadata/MapServer/info/metadata](http://boxer7:6080/arcgis/rest/services/parcels_with_metadata/MapServer/info/metadata). The browser displays the following XML metadata:

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
- <metadata sml:lang="en">
- <Esri>
  <CreateDate>20110719</CreateDate>
  <CreateTime>11405300</CreateTime>
  <ArcGISFormat>1.0</ArcGISFormat>
  <ArcGISStyle>ISO 19139 Metadata Implementation Specification</ArcGISStyle>
  <SyncOnce>FALSE</SyncOnce>
  <scaleRange>
    <minScale>5000000</minScale>
    <maxScale>50000</maxScale>
  </scaleRange>
  <ArcGISProfile>ISO19139</ArcGISProfile>
  <MapLySync>TRUE</MapLySync>
  <DataProperties>
    <itemProps>
      <itemName Sync="TRUE">test1.mxd</itemName>
      <imsContentType Sync="TRUE">005</imsContentType>
    </itemProps>
  </DataProperties>
  <SyncDate>20110719</SyncDate>
  <SyncTime>11431000</SyncTime>
  <ModDate>20110719</ModDate>
  <ModTime>11431000</ModTime>
</Esri>
- <dataInfo>
- <dcCitation>
  <resTitle>greenly entered in ISO editor</resTitle>
- <date>
```

- [http://boxer7:6080/arcgis/rest/services/parcels\\_with\\_metadata/MapServer/info/metadata](http://boxer7:6080/arcgis/rest/services/parcels_with_metadata/MapServer/info/metadata)

# Interoperability Enablers

## Standards used in creation of Geo Information products

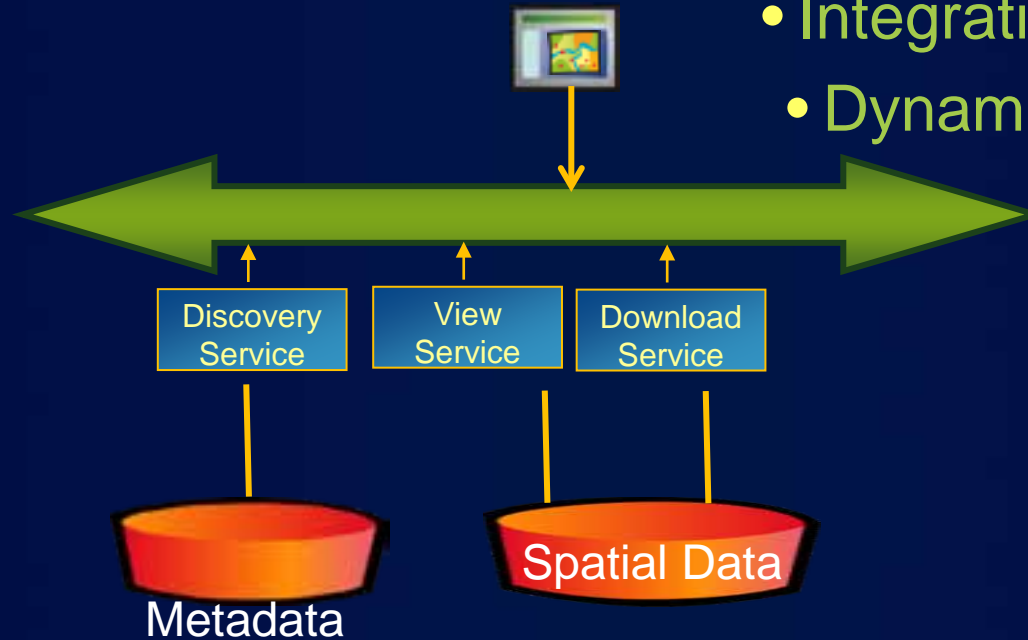
- Data:
  - Simple Features Model, ...
  - WKT, WKB, Spatial Types, GML, netCDF, ...
- Metadata:
  - ISO 19139, FGDC, ...

## Standards used for Dissemination

- On Demand Services
  - OGC Web Services - WMS, WFS, WCS, CS-W, WMTS, WPS, ...

# Services Oriented Architecture (SOA)

- Interconnected
- Interoperable
- Integrative
- Dynamic



*Loosely Coupled and Orchestrated Services*

# Types of ArcGIS Services



## Map

View or query a 2D map on the server



## Geocode

Perform address matching on the server



## Geometry

Provides basic geometric operations for use by web service clients ( ex. simplify, buffer, difference, trim, ...)



## Geoprocessing

Run a geo processing tool or model on the server and get the results back



## Image

Provide access to raster data through a Web service



## Feature

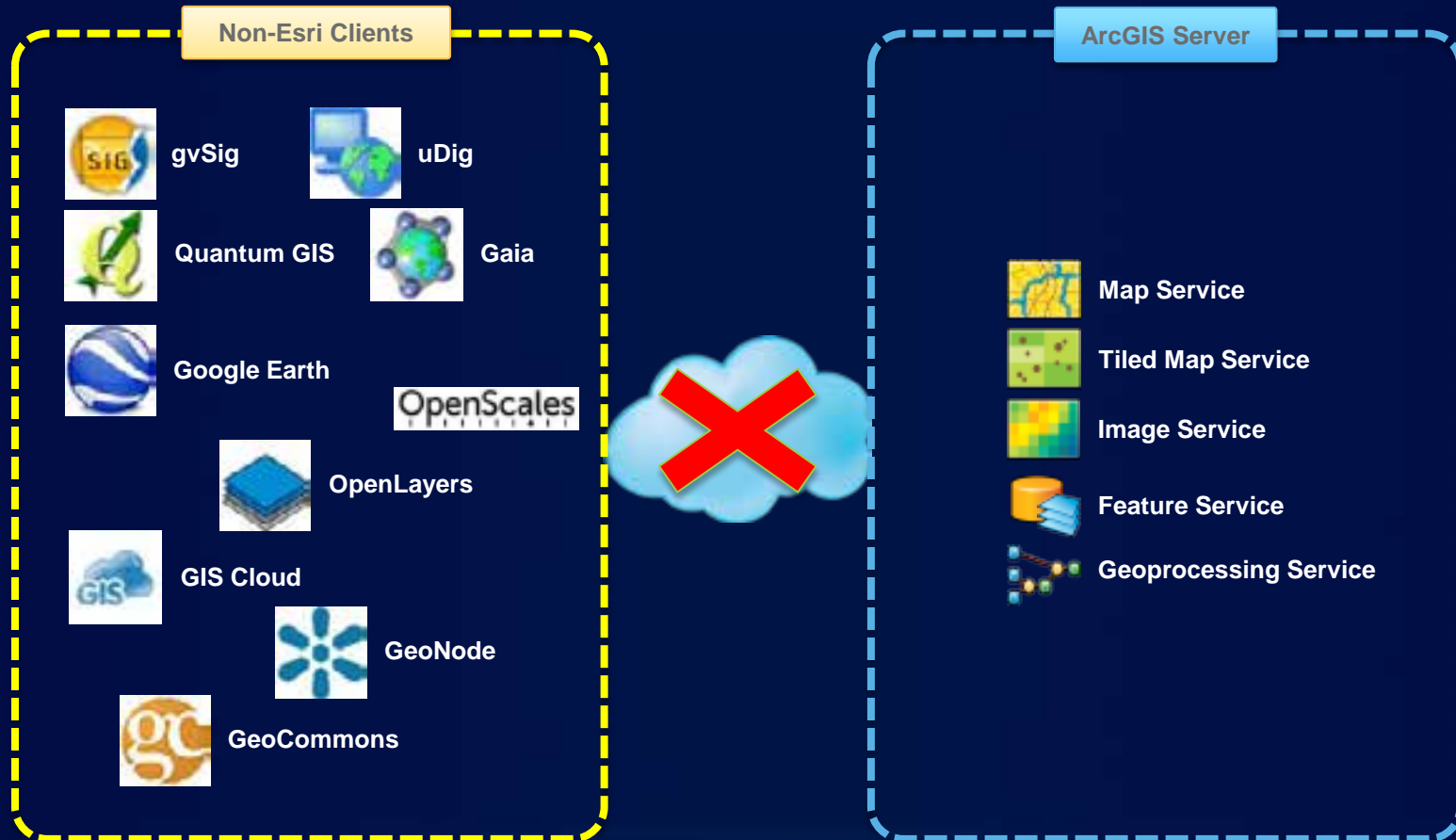
Provide access to feature querying and editing



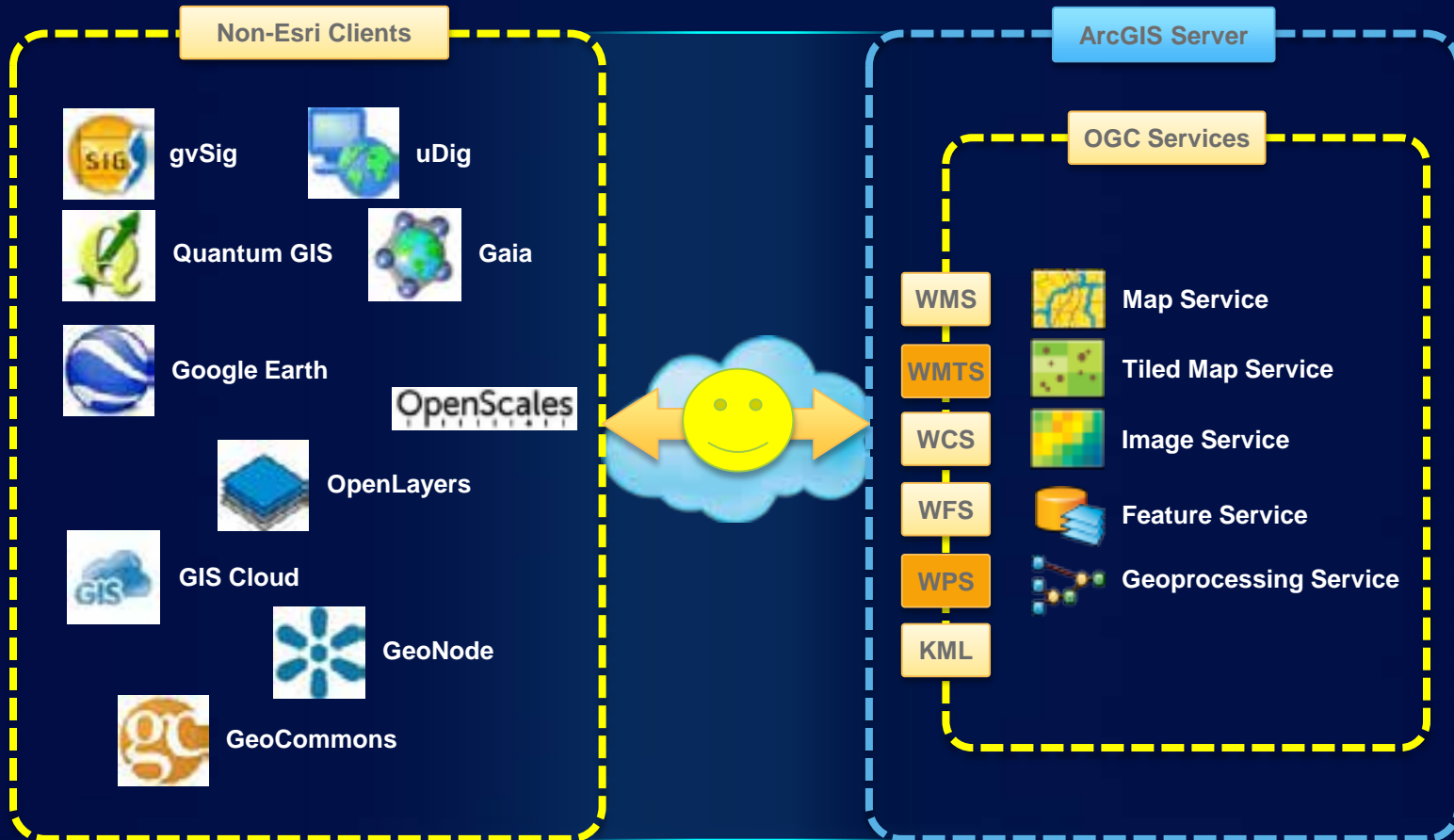
# The Esri Ecosystem



# Beyond the Esri ecosystem

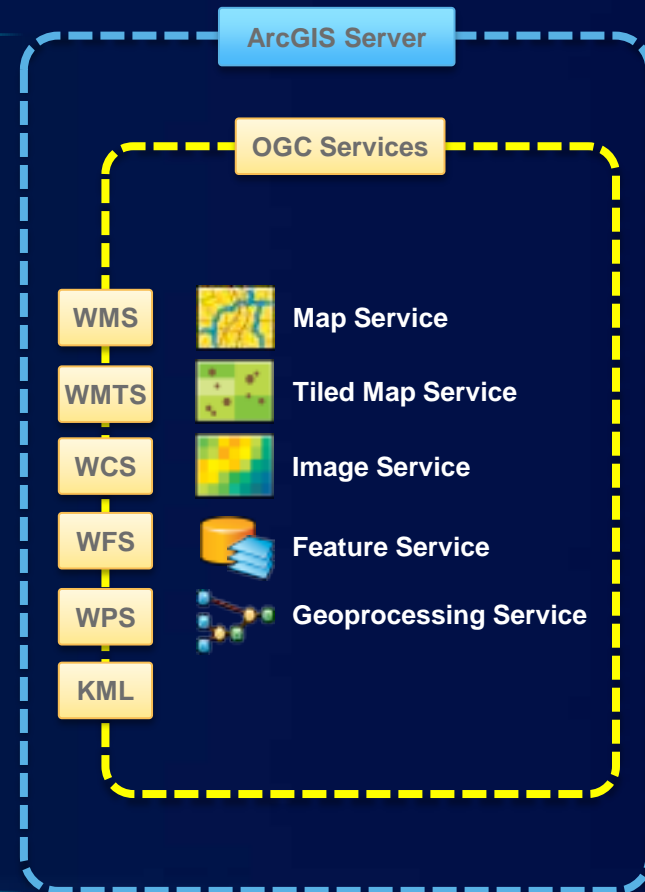


# Leverage the OGC Services in ArcGIS Server



# Inheritance

- **Cartography**
- **Security Framework**
- **Performance & Scalability**
- **Authoring, Publishing & Sharing**



# Cartography?

---

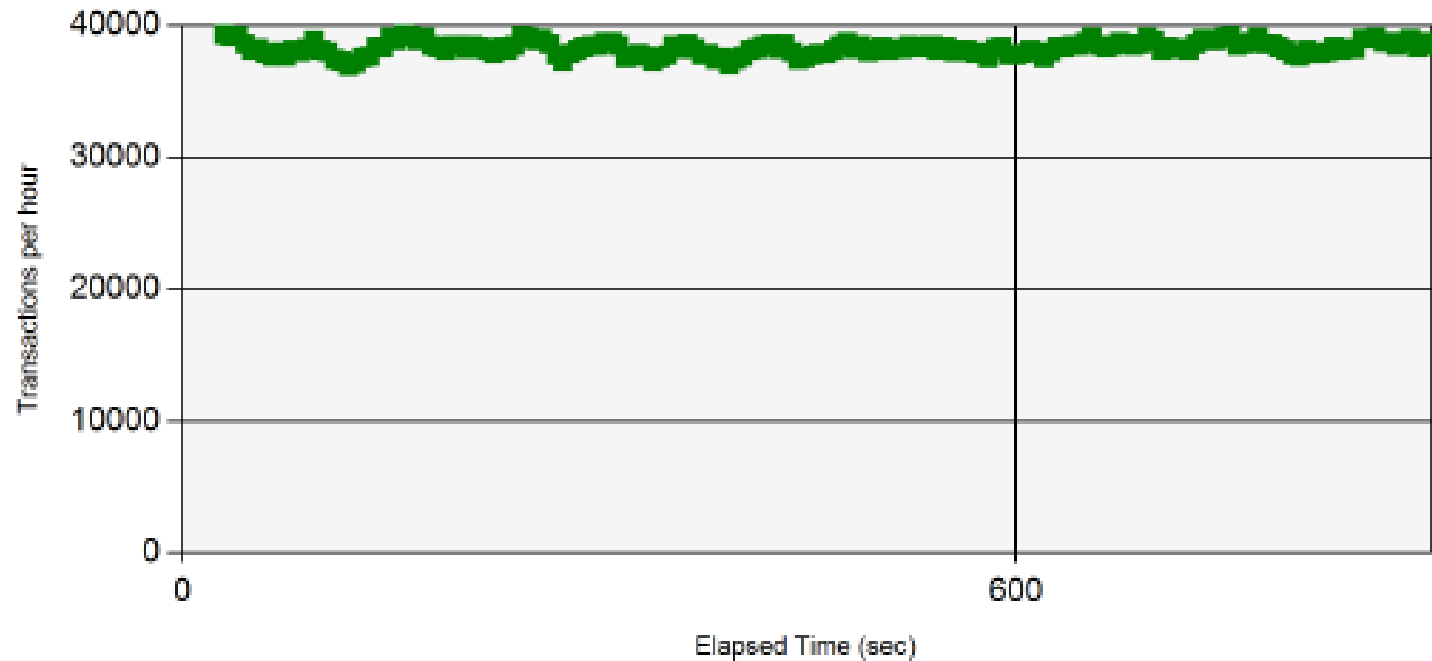
- **Symbolize map in ArcMap vs. SLD**
- **Why does GeoCat Bridge exist?**

# Security

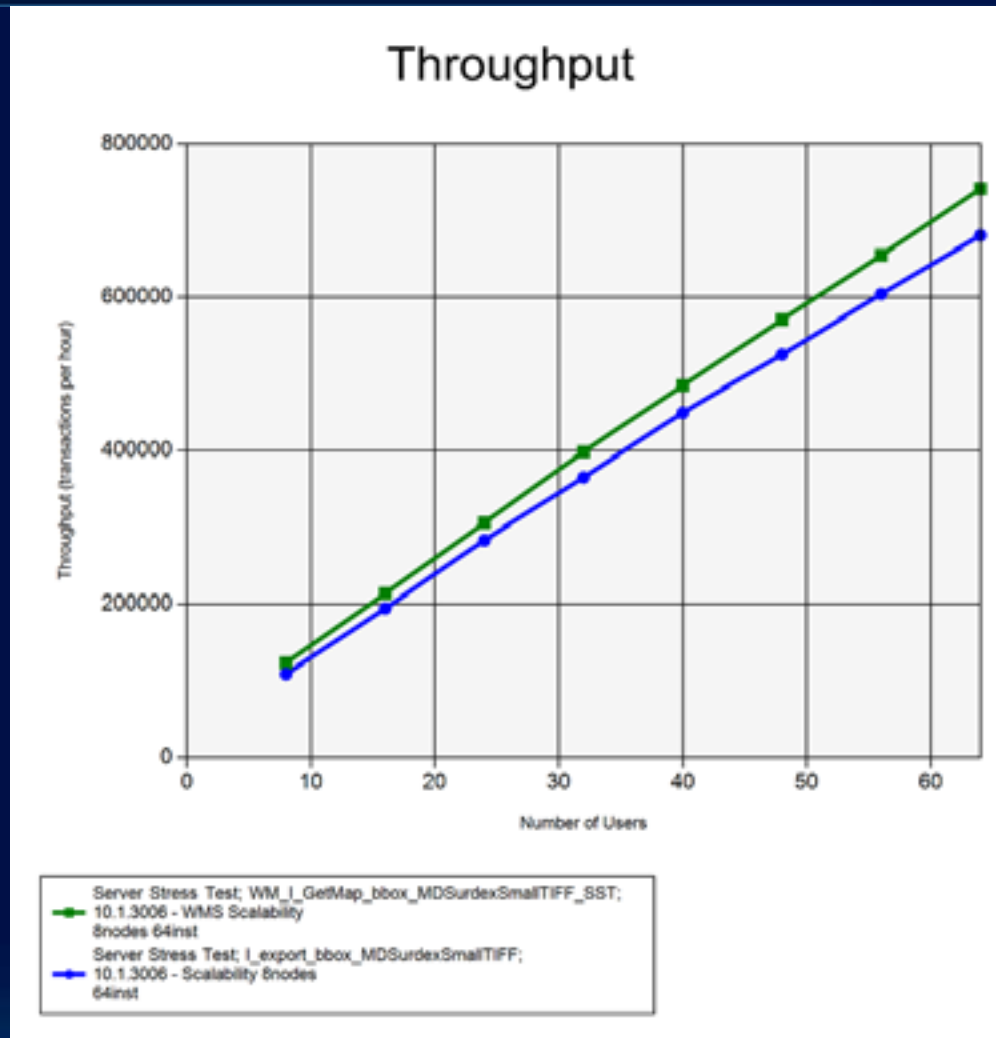
- **HTTP Basic/Digest Authentication**
- **Token based Authentication**

# Performance and Scalability

## Throughput vs Elapsed Time



# Performance and Scalability



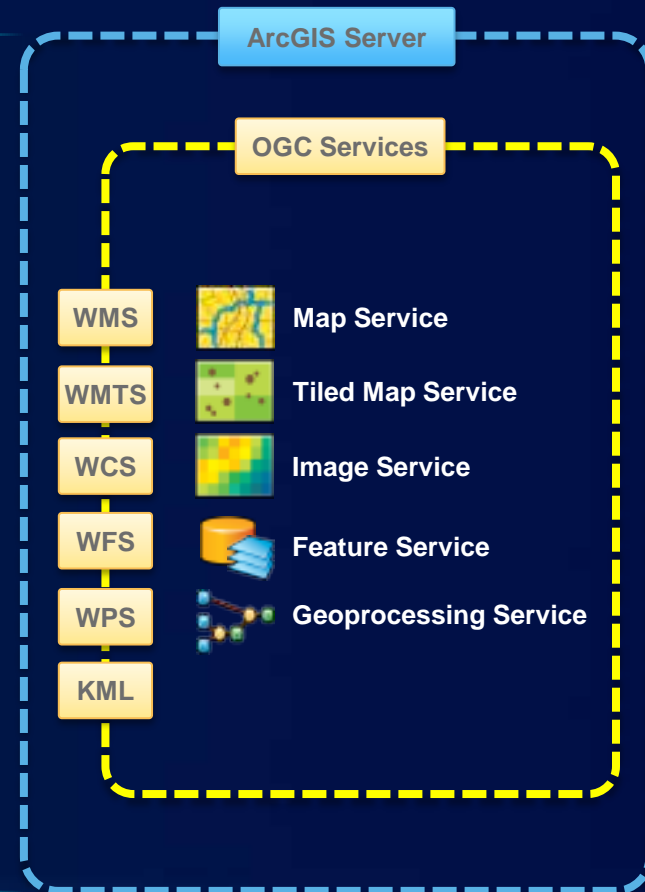


# Authoring & Publishing

- **Data packing and publishing**
- **Cache management**
- **Model Builder**

# Difference

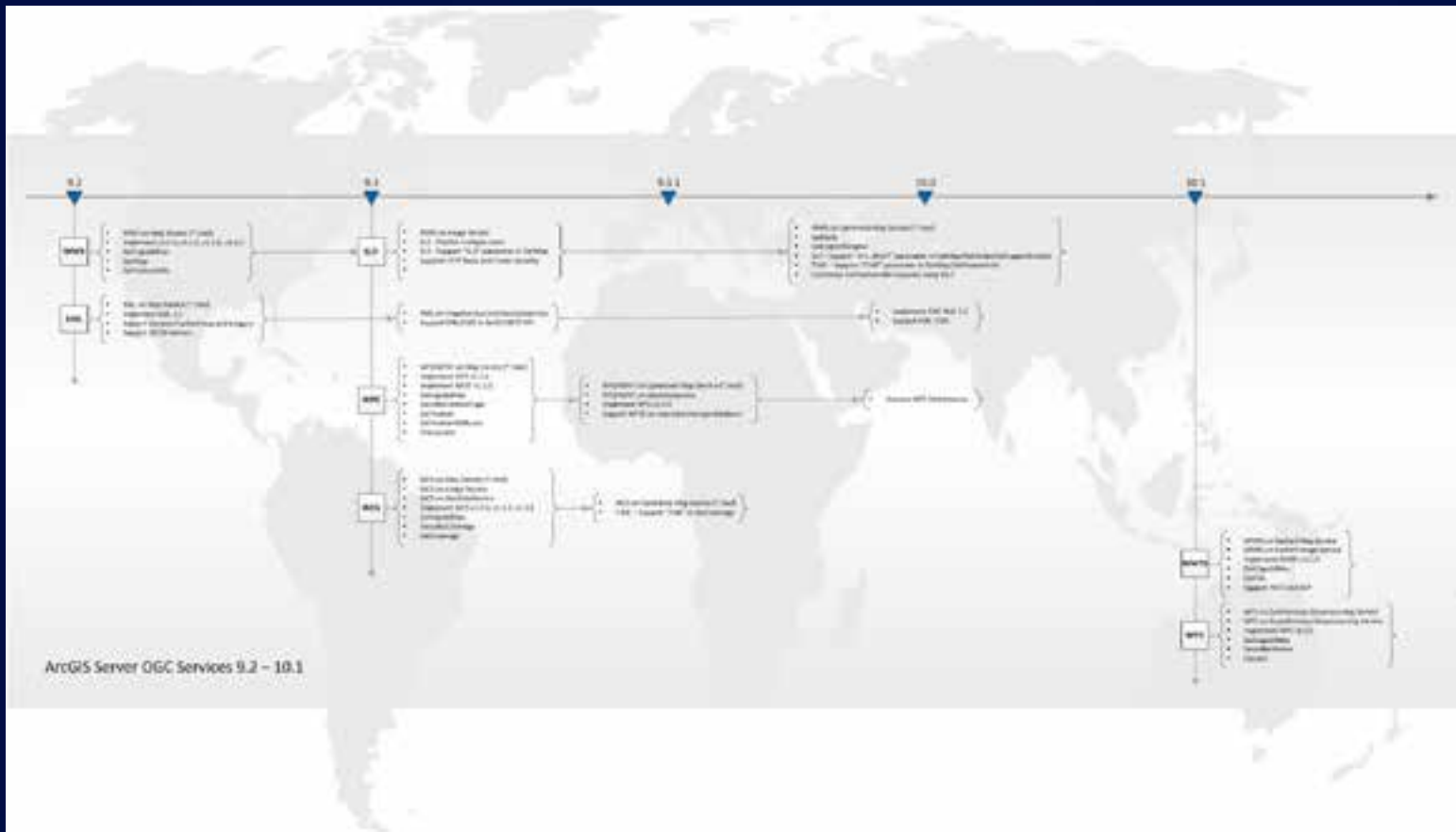
- Interfaces
- Transfer protocols
- Encoding
- Clients



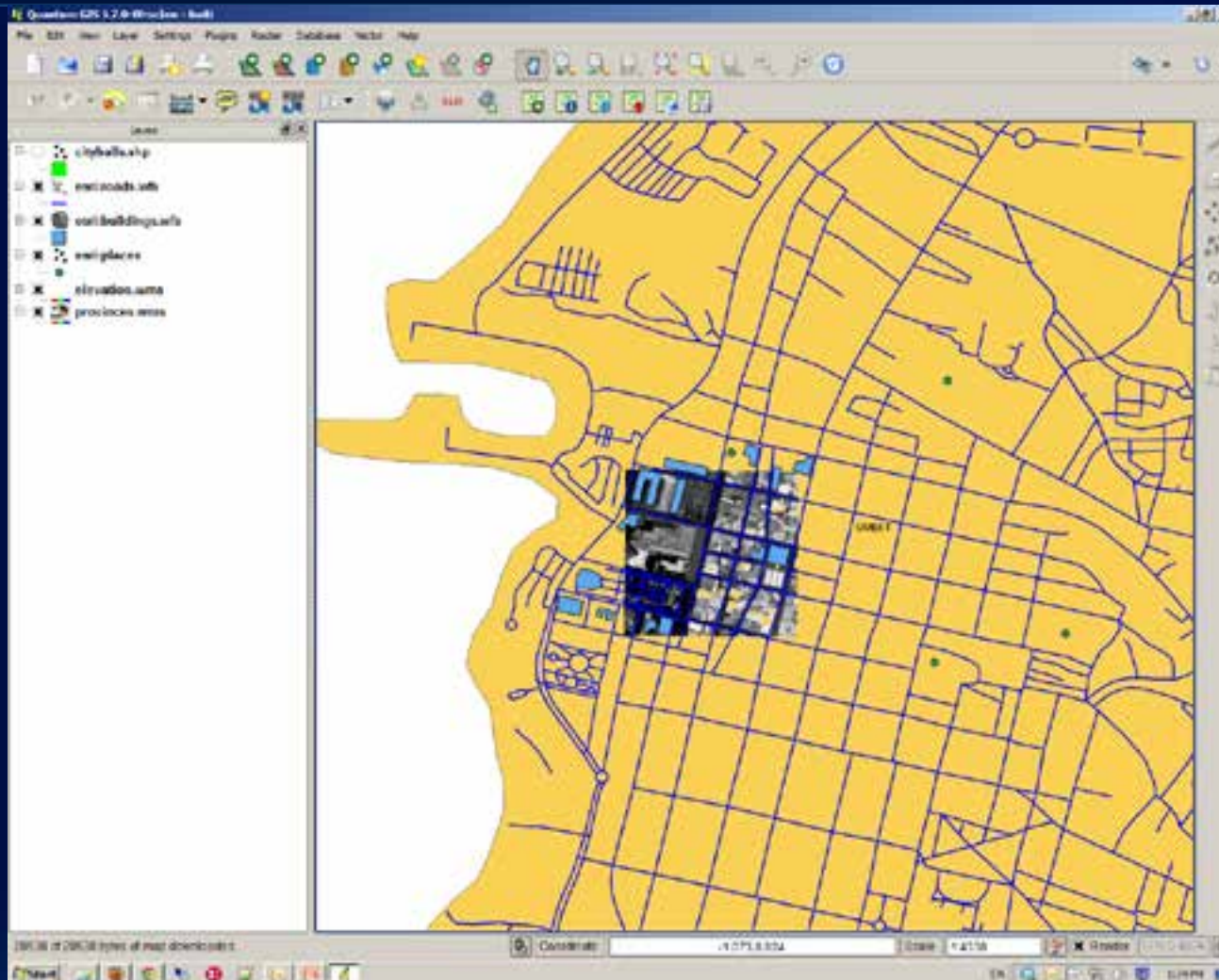
# Difference

	ArcGIS Server OGC Services	ArcGIS Server Services
Interfaces	OGC (ISO) Specifications	SOAP API & GeoService REST API
Transfer protocol	OGC RESTful	SOAP & REST
Encoding	XML (GML, SLD, FE, etc.)	SOAP XML & GeoService REST JSON
Clients	OGC compliant clients	Esri products (ArcGIS Desktop, Esri WebAPI, ArcGIS.com), ...

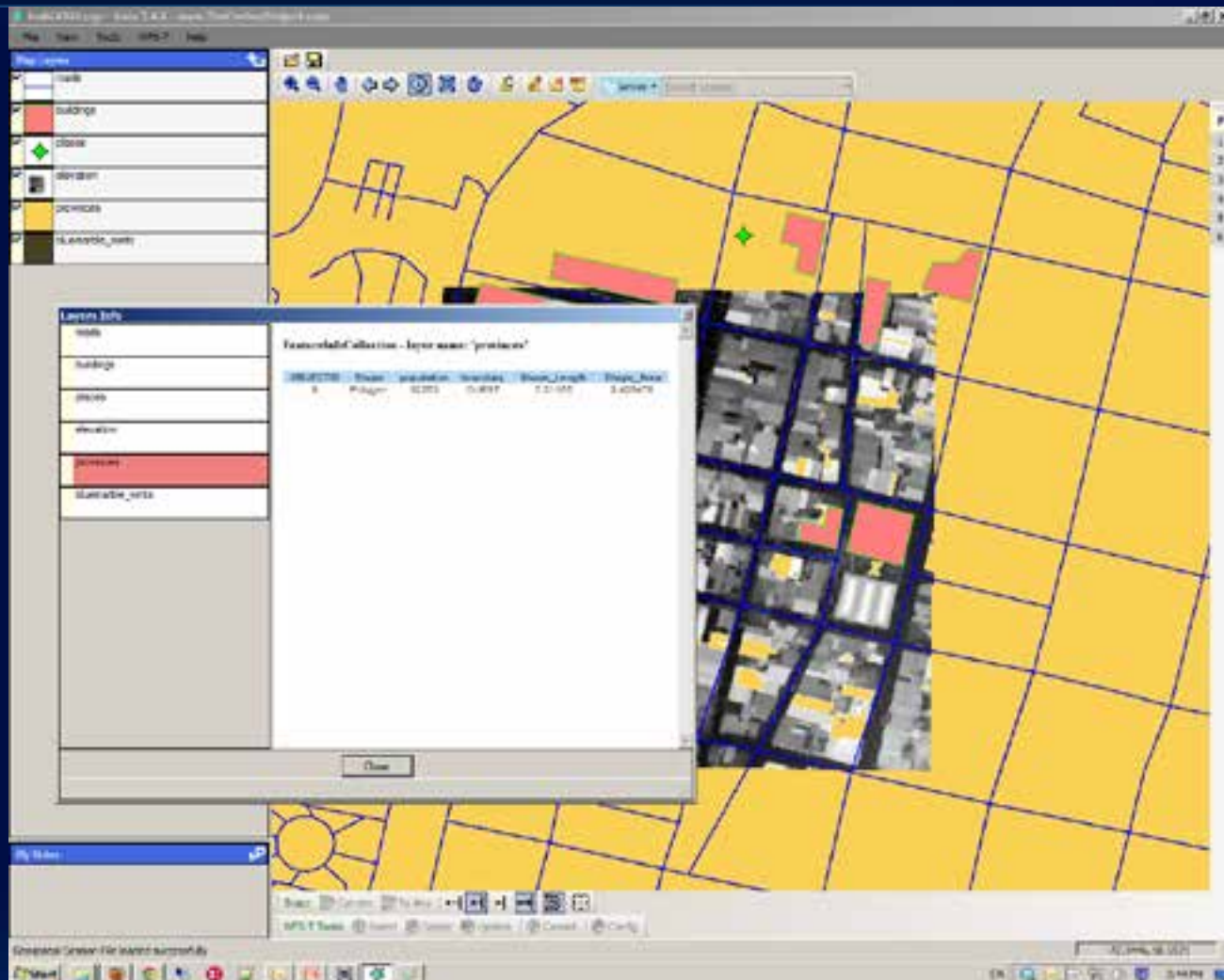
# OGC Services 9.2 – 10.1



# Quantum GIS



# Gaia





# Gaia WFST Editing

The screenshot displays the Gaia WFST Editing application window. The main map area shows a geographical area with a blue polygon representing a selected feature. The interface includes a menu bar (File, View, Tools, Help), a toolbar with various editing tools, and a status bar at the bottom indicating the Geospatial Session File loaded successfully and the coordinates -157.9139, 21.3442.

The right-hand side of the interface features the **WFS-Transactional Tool** panel, which is currently set to **Update Feature**. This panel includes the following sections:

- Select layer:** A dropdown menu showing "SwampA".
- Select Feature:** A section indicating "1 out of 1 feature" selected. The tree view shows:
  - SDE\_WFST\_ArcSDE\_WFS.SwampA
    - VEG
    - COMMENTS = Swampland near air
    - SHAPE
      - Polygon

Below the tree view is a scroll bar and navigation buttons: |<< << >> >>|.

The **Properties** tab is active, showing a table with the following data:

Name	Value
VEG	
COMMENTS	Swampland near airfield

Below the table, there is a timestamp: **INSERT at 9/14/2008 2:18:33 PM**. At the bottom of the panel are buttons for **Select**, **Geometry** (highlighted in green), and **New Geom**. A large **Update Feature** button is located at the very bottom of the panel.

# Gaia WMTS

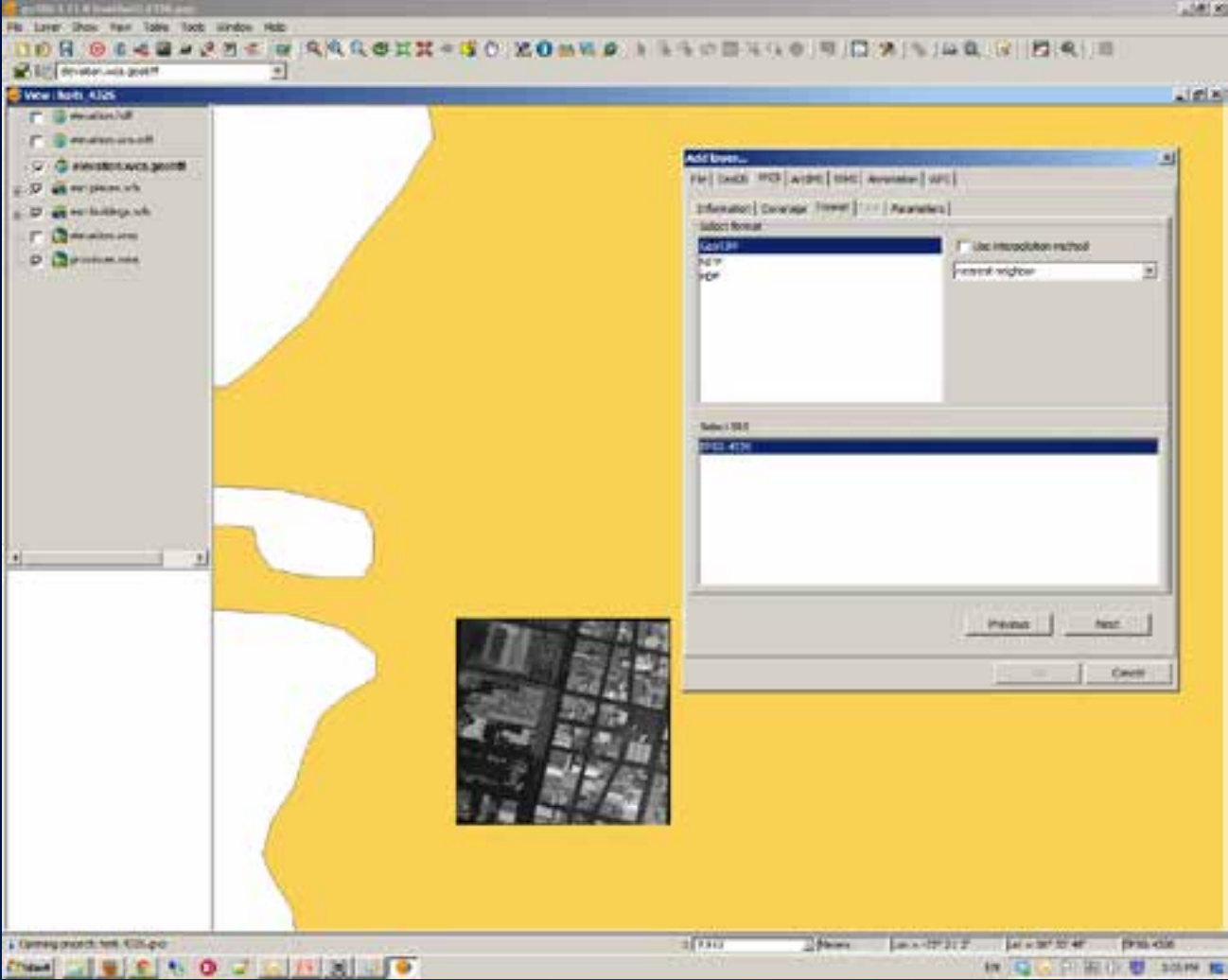
The screenshot displays the Gaia 3.4.2 web mapping application interface. The main window shows a satellite map of the North Atlantic region. A 'Map Layers' panel on the left lists the 'bluemaple\_wmts' layer. An 'Add Layer to Map' dialog box is open, showing a table of OGC Services:

Service Name	Type	Version	Address
bluemaple_wmts	WMTS	1.0.0	http://www.bluemaple.com/resources/capabilities/wmts/bluemaple_wmts/1.0.0
bluemaple_wmts	WMTS	1.0.0	http://www.bluemaple.com/resources/capabilities/wmts/bluemaple_wmts/1.0.0

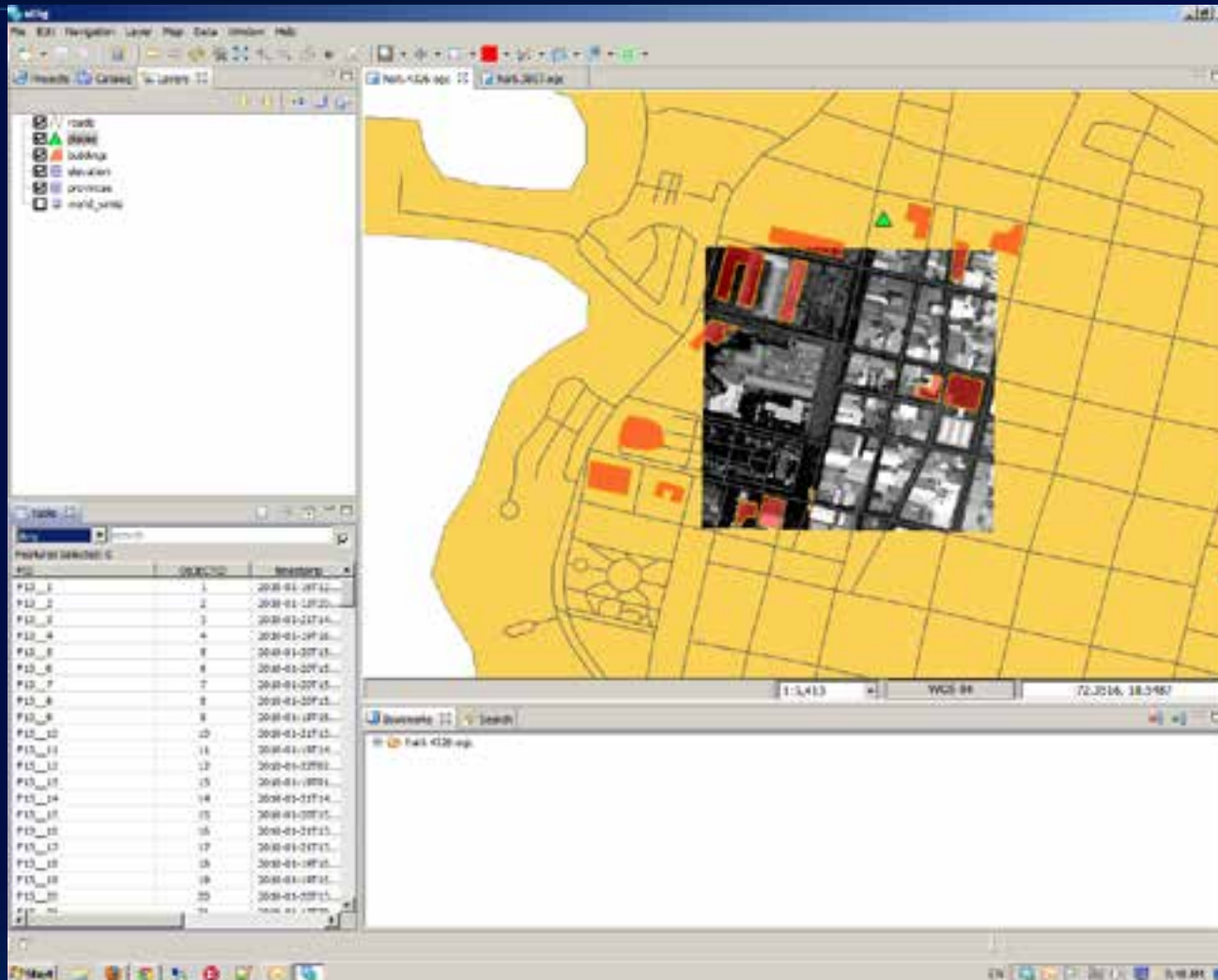
The dialog also shows 'Map Parameters' (Format: image/png, Style: default\_style) and 'WMTS Parameters' (Set: default020m). A 'Selected Layer Info' panel at the bottom right provides details for the 'bluemaple\_wmts' layer, including its title, namespace, and supported file types (png, image/png). The bottom of the screen shows a status bar with 'Gaia ready! (product version 3.4.2.0000)' and a log window with XML metadata for the layer.



# gvSig WCS



# uDig

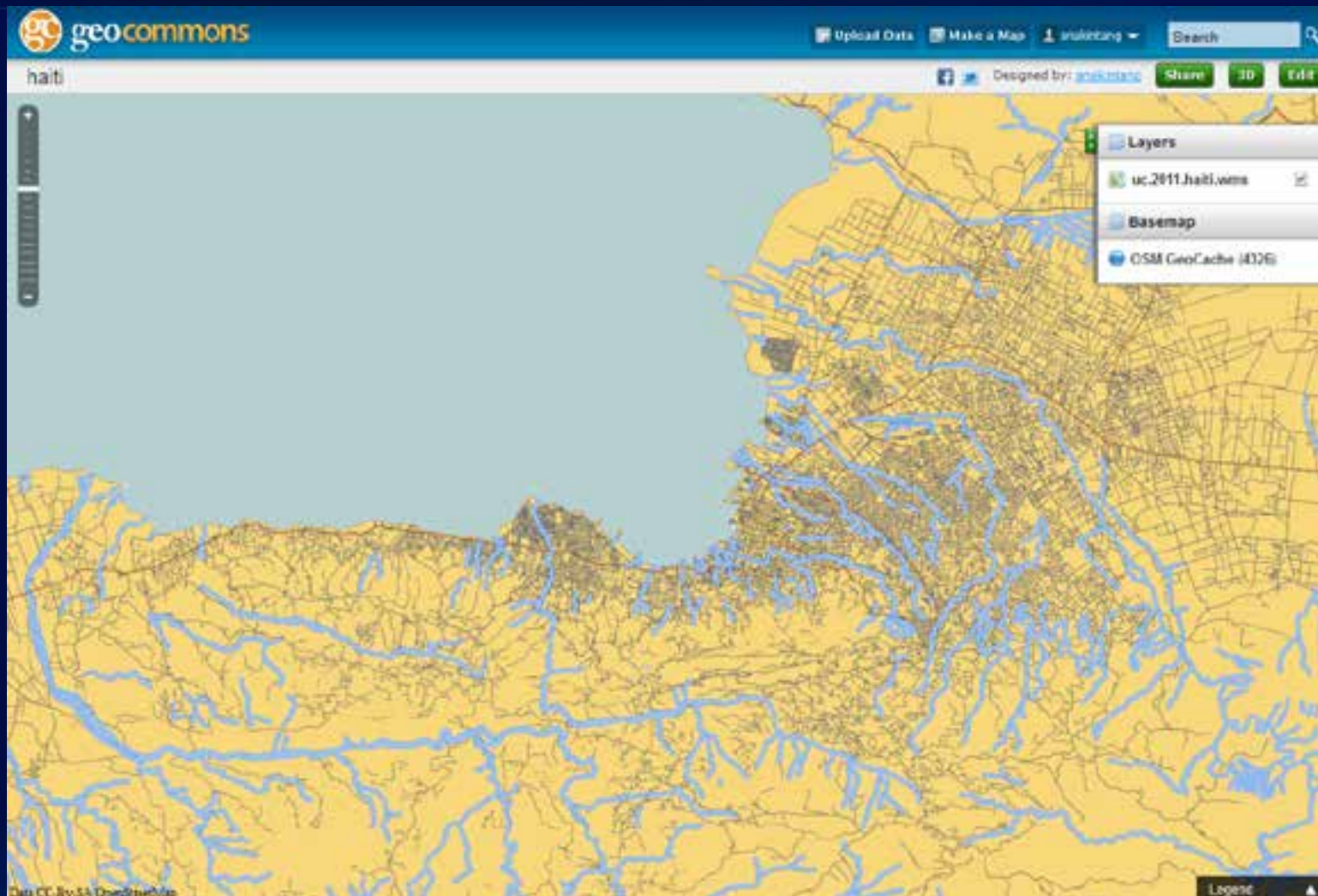


# OpenLayers WFST Editing

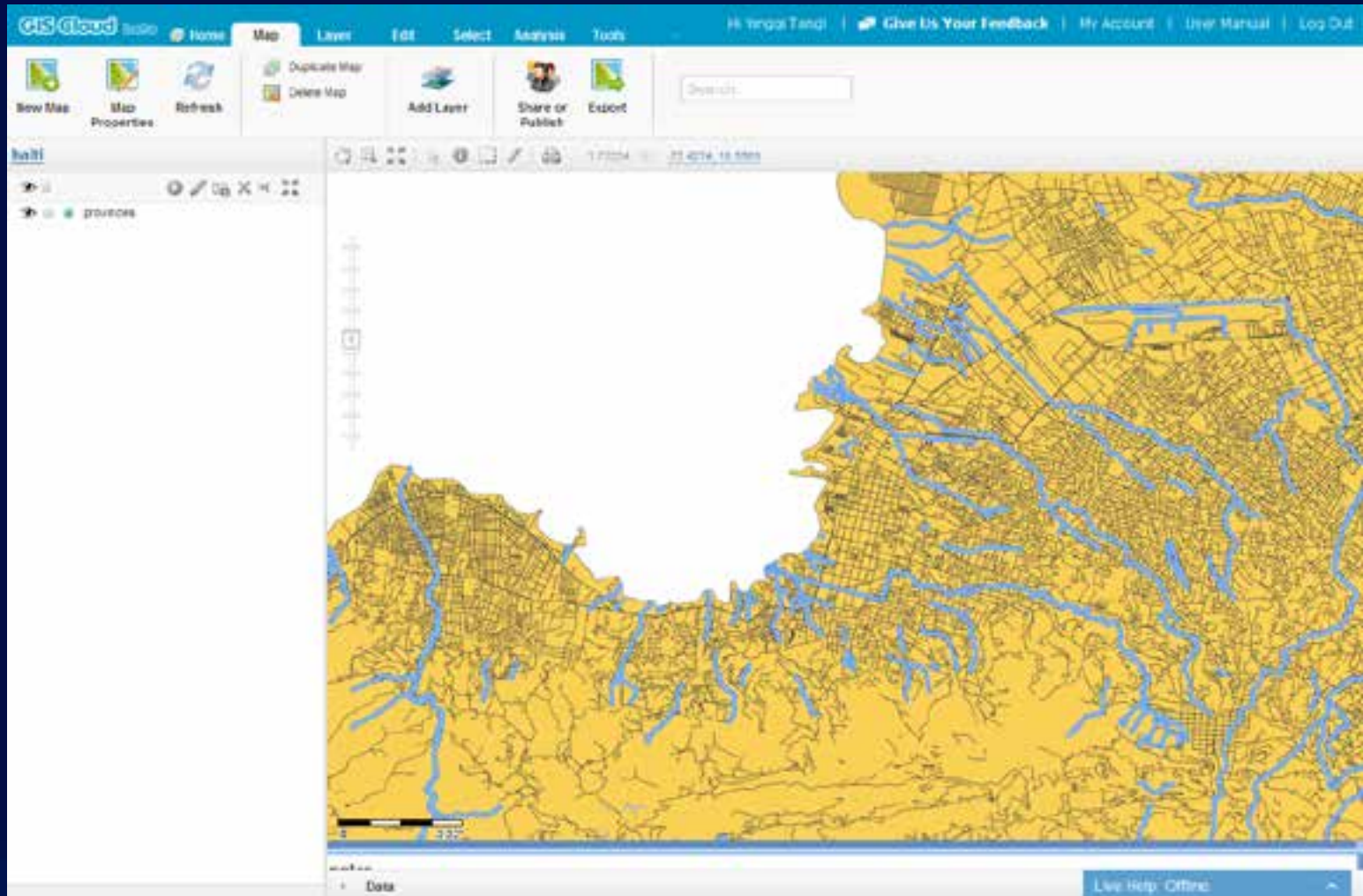




# GeoCommons



# GIS Cloud



# GeoNode

The screenshot displays the GeoNode web interface. At the top left is the GeoNode logo. The top right navigation bar includes the user name "anakitang", a "Change password" link, and a "Log out" link. Below the navigation bar, the breadcrumb path reads "maps / list.2011.html.wms" and a "View info" link is visible on the right. The main interface features a map of a region with several colored overlays: a dark red area in the center, a yellow area to the north, and a brown area to the south. A legend on the left side of the map is titled "Legend" and lists the following layers:

- Overlays
  - places
  - waterway
  - roads
  - province
- Base Layers
  - osmmap
  - osmbackground
  - OpenStreetMap

The map also shows various geographical features like rivers, roads, and place names. A scale bar is located at the bottom right of the map area.





# Publishing OGC Services

Satish Sankaran

Yingqi Tang



Fulton County Dept. of Health and Wellness/District 3, Unit 2, 2014

DeKalb County, GA

# Dynamic Rendering – WMS SLD

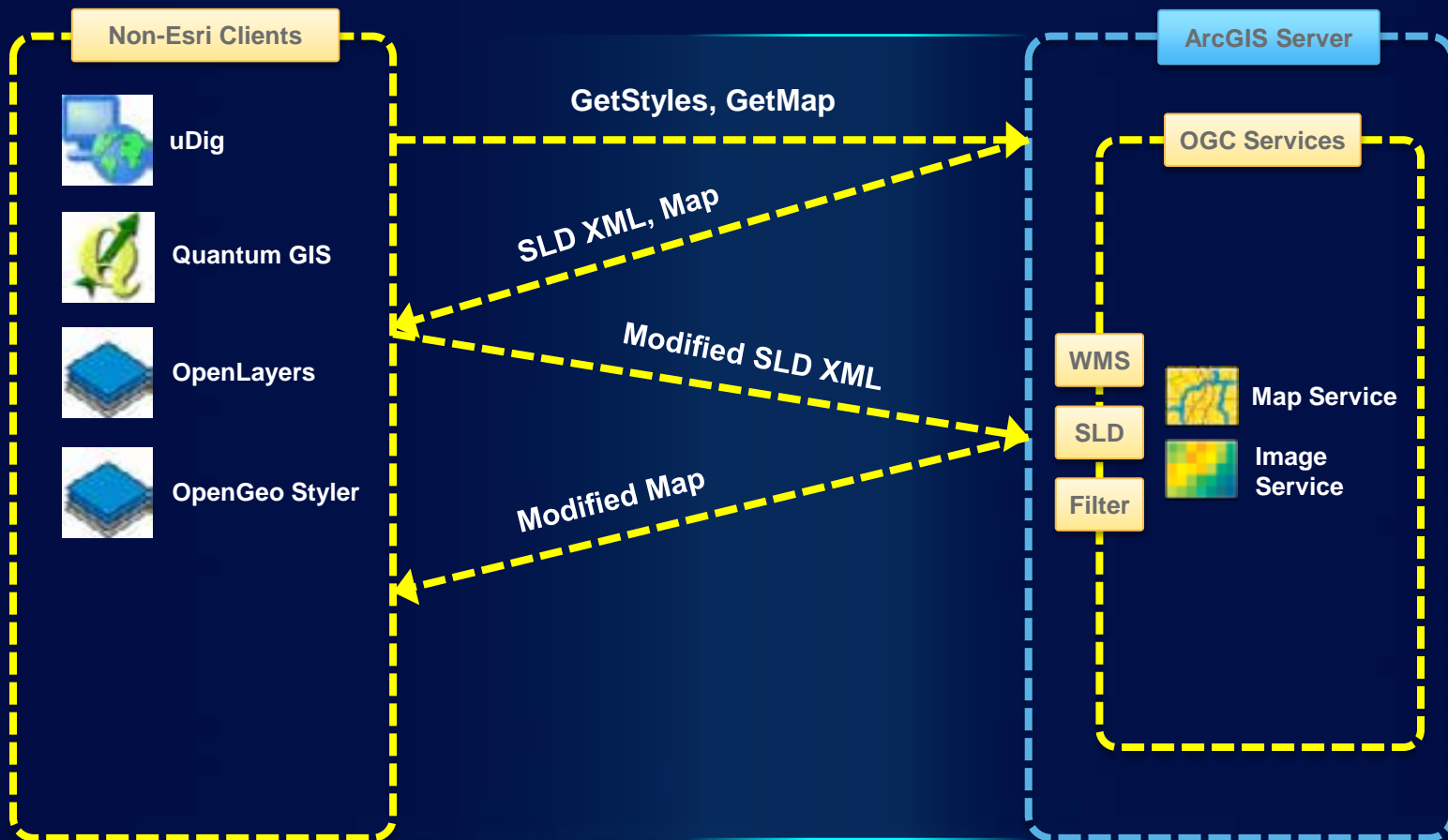
Satish Sankaran

Yingqi Tang





# Dynamic Rendering – WMS SLD



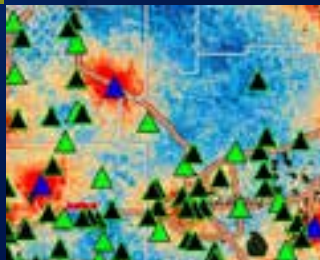
DeKalb County, Georgia

Fulton County Dept. of Health and Wellness/District 3, Unit 2, Office

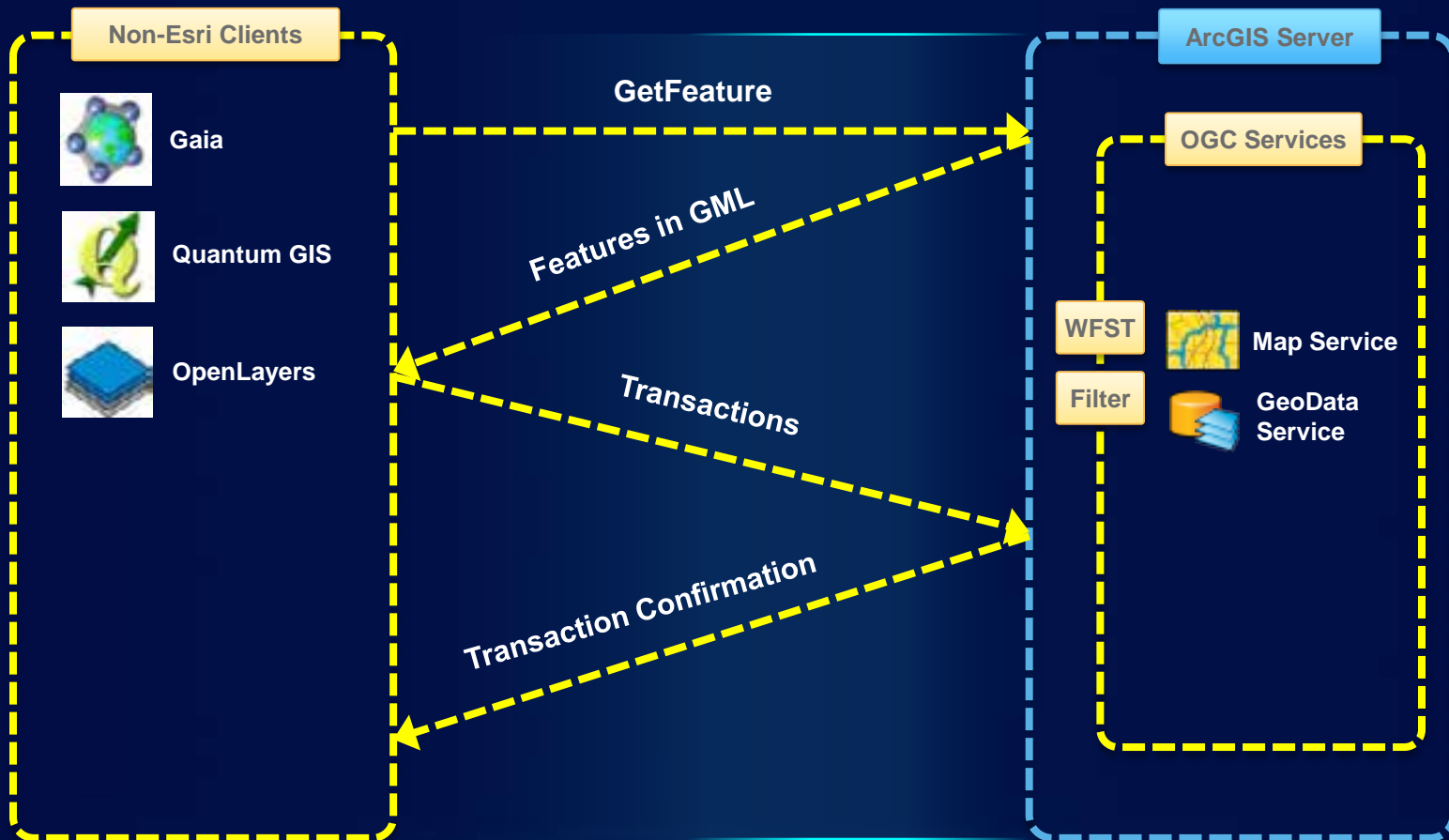
# OpenLayers WFST Editing

Satish Sankaran

Yingqi Tang



# Feature Editing – WFST



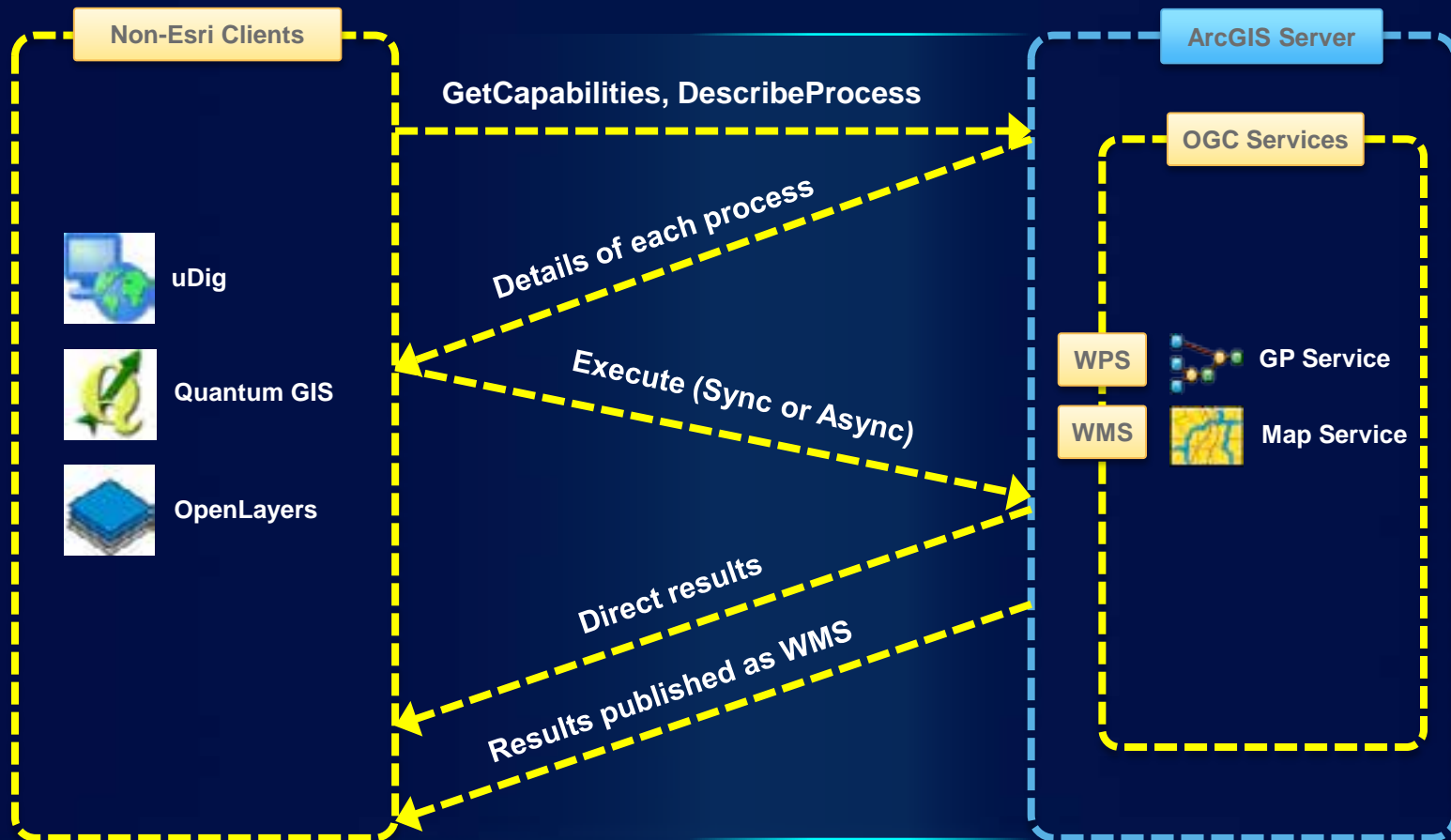
# Geoprocessing in Quantum GIS

Satish Sankaran

Yingqi Tang



# Web Geoprocessing - WPS



## OGC / ISO standards support ( ArcGIS 10.1)

- WMS
  - + SLD
  - + Filter Encoding Support
  - + Time Support
- WFS
  - + Transactions
  - + Filter Encoding Support
- WCS
  - +GeoTiff, NITF, HDF, JPEG, JPEG2000, PNG
- WMTS
  - + REST & KVP Encoding
- WPS
  - + Synchronous
  - + Asynchronous
  - + Data and Services as inputs
- CSW
  - + OGC Core
  - + ISO 19139
  - + ebRIM

<http://www.esri.com/library/whitepapers/pdfs/supported-ogc-iso-standards.pdf>

# ArcGIS Support for OGC Web services

- **Server**
  - ArcGIS Server
  - Esri Geoportal Server
  - .....
- **Client**
  - Desktop Applications
  - API's
  - Viewers
  - .....
- **More Information**
- **ESRI Web Site : White papers, Product Support Matrix, OGC compliancy**
  - <http://www.esri.com/standards>

# GIS

- **Creating and Managing Geo Information Products**

- **Proprietary**
- **Open Specifications**
- **Standards**



Shapefiles

Open FGDB Api

- **Dissemination of Geo Products**

- **Proprietary**
- **Open Specifications**
- **Standards**



Geoservices REST Specification

Geoservices REST Specification



**Questions ?**